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(54) **Method of decoding bar codes**

Verfahren zum Dekodieren von Strichcodes

Méthode de décodage de codes à barres

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(56) References cited:
EP-A- 0 478 345 **WO-A-97/46965**
US-A- 5 801 369

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Description

Technical Field of the Invention

[0001] The present invention relates generally to deciphering information encoded in bar codes and, more particularly, to determining if data representing a bar code is in a predetermined bar code format.

Background of the Invention

[0002] Bar codes are used in numerous applications to identify objects to which the bar codes are affixed. Examples of bar codes include the uniform price code used to identify retail goods and various forms of shipping labels used to track parcels. A bar code is an optical symbol containing coded information, in which the symbol is able to be imaged by an imaging device. The imaging device generates an image of the bar code and converts the image to machine-readable image data, referred to herein simply as "image data." The image data is output to a processor, which deciphers the image data representing the bar code to "read" the bar code. Reading the bar code is the operation of deciphering the bar code to obtain the information encoded in the bar code. The information encoded in the bar code may, as an example, identify the object to which the bar code is affixed.

[0003] A bar code may, as an example, be a representation of a character set, e.g., ASCII characters represented by binary numbers. One type of bar code format that represents a binary number consists of an array of alternating reflective and nonreflective surfaces in which the transition from one surface to an adjacent surface represents the transition from one bit to another bit of a binary number. The alternating reflective and nonreflective surfaces may, for example, be alternating reflective and nonreflective stripes. The reflective stripes are sometimes referred to herein as "spaces" and the nonreflective stripes are sometimes referred to herein as "bars." The bars may, as an example, be dark-colored stripes and the spaces may, as an example, be light-colored stripes. Each stripe, thus, represents one bit of the binary number. The stripes may, as an example, be either wide or narrow. A wide stripe may represent a one and a narrow stripe may represent a zero. The binary number represented by the bar code is, thus, defined by the widths of the alternating bars and spaces.

[0004] One type of bar code format is known in the art as Code 39 or Code 3 of 9. Code 39 consists of an array of stripes, which consist of alternating bars and spaces. The bars and spaces are either wide or narrow. A character per the Code 39 format consists of ten stripes wherein the first stripe is a leading narrow space, leaving nine remaining stripes to comprise the character. Three of the remaining nine stripes are wide, giving the term 3 of 9. The arrangement of the three wide stripes and the six narrow stripes corresponds to a character set specified by the Code 39 format.

[0005] A bar code reader is a photoelectric device that is used to "read" bar codes. Reading a bar code is the process of analyzing the areas of high and low reflectivity to decipher the information encoded in the bar code. The bar code reader typically comprises an illuminator, an imaging device, and a processor. The illuminator serves to illuminate the bar code via an illumination beam of light. The illuminator may, for example, be a laser or an array of light-emitting diodes. An image beam of light constituting an image of the bar code reflects from the bar code. The imaging device receives the image beam and converts the image of the bar code to image data. The processor analyzes the image data to distinguish the areas of high reflectivity from the areas of low reflectivity. In the case of the Code 39 format, the processor distinguishes image data representing the reflective spaces from image data representing the nonreflective bars. The processor further analyzes the image data to determine the widths of the bars and spaces. Based on the analysis of the image data, the processor is able to decipher the information encoded in the bar code. Conventional bar code readers compare the widths of the stripes throughout the bar code, thus, the ratio of wide to narrow stripes must remain constant throughout the bar code.

[0006] The imaging device generates image data representing all objects intersected by the image beam. If the image beam happens to intersect an object other than a bar code, the imaging device will convert an image of the object to image data and the bar code reader will attempt to decipher the image data per a bar code format. The bar code reader will then output erroneous data to the user. A second problem occurs if the imaging device generates an erroneous image of the bar code, e.g., generating image data indicating too many stripes in the bar code. This results in the image data being in an incorrect format. When the bar code reader attempts to decipher the erroneous image data, the bar code reader will yield an incorrect decoding of the bar code information. A third, and related, problem occurs if the widths of the stripes represented by the image data vary throughout the bar code. This may result from the speed at which the bar code was scanned varying during the scan, the bar code being moved during the scan, printing tolerances in the bar code, and other factors. The bar code reader may not be able to distinguish the wide stripes from the narrow stripes and, thus, may not be able to decipher the information encoded in the bar code.

[0007] Therefore, a need exists for a method to assure that image data received from an imaging device represents a proper bar code format regardless of deviations in the widths of the stripes comprising the bar code.

[0008] EP 0 478 345 A2 discloses a process for reliably decoding bar codes, in which variable decoding threshold values are calculated and updated for each bar code in accommodation of the image condition of the bar code.

Summary of the Invention

[0009] A method of reading bar codes is disclosed herein. Specifically, the method determines if image data representing a bar code conforms to a particular bar code format, e.g., the Code 39 format. The method analysis image data representing the bar code to determine if the bar code conforms to specifications defined by the bar code format. For example, the method may determine whether specified quiet zones border the ends of the bar code. The method may also determine if the bar code has a specified start character and a specified stop character.

[0010] The method may also determine if the stripes comprising a bar code meet the specifications defined by the bar code format. The method sorts the stripes into groups wherein each group represents a character encoded in the bar code. The method then determines if the correct number of wide and narrow bars and spaces are present for each character. The method also determines if the stripes in each group conform to predetermined width specifications. The above-described determinations are performed on each group individually. Accordingly, the bar code reader is able to decipher the bar code even if there are variations in the ratio of the widths of the wide to the narrow stripes from one character to another as represented by the image data.

Brief Description of the Drawings

[0011]

Fig. 1 is a flow chart describing a method of reading bar codes.

Fig. 2 is a side perspective view of an autochanger that incorporates a bar code reader.

Detailed Description of the Invention

[0012] Fig. 1 is a flow chart that illustrates the method to determine whether image data received from an imaging device used in a bar code reader corresponds to the Code 39 bar code format. Specifically, the method determines if the image data corresponds to six capital alphanumeric characters per the Code 39 format. It is to be understood, however, that the following method described herein may be applicable to other bar code formats, including variations to the Code 39 format.

[0013] Code 39 is an industry standard for a specific bar code format. A bar code per the Code 39 format consists of an array of abutting stripes. The stripes alternate between nonreflective stripes, sometimes referred to herein as bars, and reflective stripes, sometimes referred to herein as spaces. A reflective stripe is a stripe that reflects more light than a nonreflective stripe. The difference in reflectivity must be great enough so that the bar code reader may distinguish the reflective stripes from the nonreflective stripes. The stripes are either wide or

narrow. Code 39 defines a character set that is based on the arrangement of the wide and narrow stripes. Each character consists of a group of nine stripes in which each character has an additional leading space, which is typically narrow. The leading space serves to separate the characters and is sometimes referred to herein as an interchange gap. Three of the nine stripes comprising each character are wide and, accordingly, the remaining six stripes are narrow.

[0014] The Code 39 format specifies other indicia to assist the bar code reader to decipher the bar code. The bar code may have leading and trailing quiet zones. The quiet zones are reflective areas, similar to very wide spaces, that are located on both ends of the array of stripes comprising the bar code. The bar code information located between the quiet zones may commence and terminate with a start character and a stop character respectively. An asterisk is typically used as both the start character and the stop character. Thus, a Code 39 bar code may have a leading quiet zone followed by a series of stripes representing an asterisk. The characters, each represented by a series of nine stripes, may follow the asterisk and the characters may be separated by interchange gaps. The last character may be followed by a series of stripes representing another asterisk, which may be followed by the trailing quiet zone.

[0015] The capital alphanumeric characters defined by the Code 39 format each have two wide bars and one wide space. Accordingly, the remaining stripes consist of three narrow spaces and three narrow bars. The Code 39 format specifies the dimensions of the stripes and the ratios between wide stripes and narrow stripes. It is to be understood, however, that the method described herein is not bound by these specifications and they are only used as references. A narrow stripe may have a minimum width of .0075 inches. The ratio of wide to narrow stripes may range between 2.0 and 3.0, but should exceed 2.2 if the narrowest stripe is greater than .02 inches. The interchange gap may have a minimum width equal to the narrowest stripe. The interchange gap may have a maximum width equal to 5.3 times the width of the narrowest stripe when the narrowest stripe is less than .01 inches. The maximum width of the interchange gap may be three times the width of the narrowest stripe or .053 inches (whichever is greater) when the narrowest stripe is equal to or greater than .01 inches. The minimum width of the quiet zones may be 10 times the width of the narrow stripes. The method described herein may read a bar code per the Code 39 format, but with greater tolerances than those described above. For example, the ratio of the widths of the wide stripes to the narrow stripes may be reduced to 1.5, the interchange gap may be simply an imageable space, and the stripes may be virtually any width so long as they are imageable.

[0016] Having described the Code 39 format, a method of reading bar codes will now be described. The image data described herein represents a bar code pursuant to the Code 39 format. The bar code has six data charac-

ters, an asterisk used as a start character, and an asterisk used as a stop character. This description focuses on the image data representing the bar code. The image data may have been received through various bar code imaging techniques as are known in the art, which yield the widths of the stripes and whether the stripes are bars or spaces. An example of such an imaging technique is described further below as used by an autochanger.

[0017] The bar code reader may commence analyzing the image data by determining if the leading quiet zone is present. If the leading quiet zone is present, the bar code reader may measure the width of the leading quiet zone to determine if it is within a predetermined specification, e.g., 2.25 millimeters. If the leading quiet zone is not present, or if it is too narrow, the bar code reader will conclude that the bar code was not read properly. The bar code reader may then determine if the trailing quiet zone is present in the image data. If a trailing quiet zone is present, the bar code reader may measure the width of the trailing quiet zone to determine if it is within a predetermined specification, e.g., at least 2.25 millimeters. If the trailing quiet zone is not present, or if it is too narrow, the bar code reader will conclude that the bar code was not read properly.

[0018] The bar code reader may then count the number of stripes between the leading quiet zone and the trailing quiet zone. In the example described herein, there are six data characters, a start character, and a stop character. Each Code 39 character has 10 stripes including the interchange gap which is typically a narrow space constituting the first stripe of each character. The interchange gap of the start character is part of the leading quiet zone. Accordingly, the bar code has 79 stripes between the leading quiet zone and the trailing quiet zone. If 79 stripes are not present between the leading quiet zone and the trailing quiet zone, the bar code reader will conclude that the bar code was not read properly.

[0019] The image data may be separated into the individual characters represented by stripes comprising the bar code. Specifically, the image data corresponding to all the characters other than the start character may be separated into seven groups of ten stripes. Because the interchange gap of the start character is part of the leading quiet zone, the start character may have a group of nine stripes. Each group corresponds to a single character encoded in the bar code per the Code 39 format. The characters described herein are limited to capital alphanumeric characters. Pursuant to the Code 39 format, each character must have one wide space, four narrow spaces (including the interchange gap), two wide bars, and three narrow bars.

[0020] For each character group, the bar code reader may measure and record the width of the widest space, excluding the interchange gap. The remaining spaces, excluding the interchange gap, are marked as narrow spaces. The bar code reader may then measure and record the width of the second widest space, excluding the interchange gap, which is the width of the widest nar-

row space. The processor may then divide the width of the widest space by the width of the second widest space. This ratio is the ratio of the wide space to the widest narrow space. The ratios are measured for each of the eight characters comprising the bar code. The ratios are then compared to a predetermined ratio, e.g., 1.5. If any of the ratios are not greater than the predetermined ratio, the bar code reader will conclude that the bar code has not been read properly.

[0021] For each character group, the bar code reader may measure and record the width of the second widest bar. The width of the second widest bar is marked as a wide bar reference and is the width of the narrowest wide bar. The remaining bars that are narrower than the wide bar reference are marked as narrow bars. The bar code reader may then measure the width of the third widest bar, which is the width of the widest narrow bar. The bar code reader may then calculate the ratio of the wide bar reference to the width of the widest narrow bar. The bar code reader may then repeat this process for the remaining seven character groups. The bar code reader may then compare these ratios to a predetermined ratio, e.g., 1.5. If any of the calculated ratios not greater than the predetermined ratio, the bar code reader will conclude that the bar code was not read properly.

[0022] The bar code reader may now determine the correct order to decipher the image data. This is necessary because the bar code may have been imaged commencing at the leading quiet zone or the trailing quiet zone. If the bar code was imaged commencing with the trailing quiet zone, the image data will be deciphered in the incorrect order, yielding an improper decoding of the bar code information. Determining the proper order of the image data may be accomplished by decoding the first character group, which should be the start character. In the Code 39 format, the asterisk is typically used as the start character and is represented by the following stripes: narrow bar, wide space, narrow bar, narrow space, wide bar, narrow space, wide bar, narrow space, narrow bar. If the first character group does not correspond to an asterisk, the bar code reader may reverse the order of the stripes comprising the first character group to determine if the reverse order of the stripes corresponds to an asterisk. If the reverse order of stripes comprising the first character group corresponds to an asterisk, the bar code will conclude that the bar code was imaged backwards and the bar code reader may reverse the order of all the stripes for all future analysis of the bar code. If, on the other hand, the reverse order of the stripes comprising the first character group does not correspond to an asterisk, the bar code reader will conclude that the bar code was not read properly. This conclusion is based on the inability of the bar code reader to decipher an asterisk from either the forward or backward reading of the stripes comprising the first character group.

[0023] The bar code reader may then decipher the last character group to determine if the image data corresponds to the stop character. In this example, the asterisk

is used as both the start character and the stop character. If the last character group does not correspond to an asterisk, the bar code reader will conclude that the bar code was not read properly.

[0024] At this point, the bar code reader has determined that the leading and trailing quiet zones are present, all the stripes are either wide or narrow, and the start character and the stop character are both present. Additionally, the bar code reader has determined the proper order for deciphering the image data contained in the character groups. The bar code reader may now decipher the six remaining character groups, sometimes referred to herein as the data characters. In this example, the data characters are only capital alphanumeric characters. If the bar code reader deciphers any character other than a capital alphanumeric character, the bar code reader will conclude that the bar code was not read properly.

[0025] Deciphering the data characters may consist of comparing the order of the wide and narrow bars and spaces to a data file corresponding to characters per the Code 39 format. The bar code reader has previously determined which stripes are wide and which stripes are narrow. Thus, the bar code reader only needs to compare the arrangement of stripes to the data file. When the data characters have been compared to the data file, the bar code reader may output these capital alphanumeric characters in a conventional manner. If, however, any character group does not correspond to a character in the data file, the bar code reader will conclude that the bar code was not properly read.

[0026] The method of reading bar codes has been described above used on a bar code with four capital alphanumeric characters bounded by asterisks. It is to be understood, however, that the method described above may be applicable to other bar code formats. For example, the bar code may have any number of capital alphanumeric characters and does not need to be bounded by asterisks.

[0027] The method of reading bar codes as described herein will read an imperfect bar code or a bar code that may be represented by flawed image data. The method described herein deciphers each character group of stripes individually. This allows for the image data to have some tolerance in the ratio of the widths of the wide stripes to the widths of the narrow stripes between the character groups comprising the bar code. In the event the bar code was printed with tolerances or if the image data has become corrupt, the method described herein may still decipher the bar code.

[0028] Having described a method of deciphering image data representing a bar code, a method of generating image data from a bar code will now be described. Image data may be generated through numerous methods. One method of generating image data is illustrated by an autochanger 100 in Fig. 2. The autochanger 100 is a device that stores media pieces, of which the digital linear tape cartridge 120 is an example, in a magazine 200. When

the information stored on a specific media piece is required by a user, the autochanger 100 uses a picker 300 to move the media piece from the magazine 200 to a media player, not shown. Likewise, when the user no longer requires the information stored on the specific media piece, the autochanger 100 uses the picker 200 to move the media piece from the media player to the magazine 200.

[0029] Having summarized the autochanger 100, it will now be described in detail. Only the components necessary to illustrate the autochanger 100 reading a bar code 130 are illustrated in Fig. 1. Specifically, the autochanger 100 may have a magazine 200, a picker 300, and a bar code reader 400. The magazine 200 may be a generally parallelepiped structure having a front surface 210. The front surface 210 may have a series of slots 220 that are adapted to hold digital linear tape cartridges. A slot 222 is illustrated holding the digital linear tape cartridge 120. The digital linear tape cartridge 120 may have a front side 122. A bar code 130 may be affixed to the front side 122 of the digital linear tape cartridge 120. The bar code 130 may have a top side 132 and a bottom side 134. Information may be encoded on the bar code 130 from the top side 132 toward the bottom side 134. Accordingly, the leading quiet zone may be in the vicinity of the top side 132 and the trailing quiet zone may be in the vicinity of the bottom side 134. The bar code 130 may conform to the Code 39 format as described above.

[0030] The picker 300 may be a generally parallelepiped structure that may serve to transport digital linear tape cartridges within the autochanger 100. The picker 200 may be operatively attached to a servo system, not shown, in a conventional manner. The servo system may serve to move the picker 200 in a vertical direction 110, a plunge direction 112, and a transverse direction 114. An orientation system, not shown, may also be operationally attached to the picker 300 in a conventional manner. The orientation system may provide information pertaining to the location of the picker 300, which may be readily used to determine the incremental movement of the picker 300.

[0031] The picker 300 may have a top side 310. The bar code reader 400 may be affixed to the top side 310 in a conventional manner. The bar code reader 400 may, as an example, be a fixed beam bar code reader as is known in the art. The bar code reader 400 may receive light from an image beam 410. The image beam 410 may be located in a fixed position relative to the bar code reader 400. An example of a commercially available bar code reader is available from the Welch Allyn Company of Skaneateles Falls, New York, and is referred to as Model 6500.

[0032] Having described the autochanger 100, it will now be described using the combination of the picker 300 and the bar code reader 400 to read the bar code 130. The bar code 130 is positioned within the autochanger 100 so that the information encoded on the bar code 130 is read on an axis extending in the vertical direction

110 from the top side 132 toward the bottom side 134. The servo system, not illustrated, moves the picker 100 in the vertical direction 110, the plunge direction 112, and the transverse direction 114 to a position wherein the image beam 410 intersects the top side 132 of the bar code 130. The picker 300 then moves in the vertical direction 110 so that the image beam 410 scans from the top side 132 to the bottom side 134 of the bar code 130. As the image beam 410 scans the bar code 130, the orientation system, not illustrated, outputs data corresponding to the vertical position 110 of the picker 300. The bar code reader 400 receives the information from the orientation system and uses the orientation information to determine the widths of the stripes comprising the bar code 130. When the bar code reader 400 has generated image data representing the bar code 130, the bar code reader 400 then deciphers the bar code per the above-described method.

[0033] An embodiment of the bar code reader 400 uses a charge-coupled device to generate the image data. A charge-coupled device may have an image beam that is appropriately sized to generate an image of the entire bar code 130 without the need to move the picker 300 in the vertical direction 110. Another embodiment of the bar code reader 400 uses a scanning image beam. The image beam scans in the vertical direction 110 over a distance that is appropriately sized to include the entire bar code 130. Accordingly, the picker 300 does not have to move the bar code reader 400 in the vertical direction 110 to generate an image of the bar code 130. Both of the above-described embodiments may use the method of reading a bar code as described herein.

[0034] It is contemplated that the inventive concepts herein described may be variously otherwise embodied as far as they fall within the scope of the appended claims.

Claims

1. A method of reading bar codes comprising:

receiving data representing an image of said bar code (132) which is to be read;
 performing a first analysis on said data wherein said first analysis determines if said bar code (132) is bounded by areas of reflectivity and terminating said method if said bar code is not bounded by areas of reflectivity;
 performing a second analysis on said data wherein said second analysis counts the number of stripes on said bar code (132) between said areas of reflectivity and terminating said method if said number of stripes is not equal to a predetermined number;
 performing a third analysis on said data wherein said third analysis compares the width of the widest reflective stripe on said bar code (132) to the width of the second widest reflective stripe

on said bar code (132) and terminating said method if the ratio of the width of the widest reflective stripe to the width of the second widest reflective stripe is not greater than a predetermined value;

performing a fourth analysis on said data wherein said fourth analysis compares the width of the second widest nonreflective stripe on said bar code (132) to the width of the third widest nonreflective stripe on said bar code (132) and terminating said method if the ratio of the width of the widest reflective stripe to the width of the third widest non-reflective stripe is not greater than a predetermined value;

performing a fifth analysis on said data wherein said fifth analysis deciphers said data.

2. The method of claim 1 wherein said performing a second analysis comprises determining if nine stripes are present on said bar code (132) between said areas of reflectivity.

3. The method of claim 1 wherein said bar code (132) is affixed to a media piece (120).

4. The method of claim 1, wherein said data comprises a series of data segments, and wherein each data segment represents a stripe on said bar code (132); performing a sixth analysis on said data wherein said sixth analysis counts the number of said data segments and terminating said method if the number of said data segments is not equal to a preselected value;

grouping said data segments into groups of successive data segments wherein each group has a predetermined number of data segments;

performing a seventh analysis on a first group of said groups of successive data segments wherein said seventh analysis compares the width of the widest reflective stripe represented by a data segment in said first group of said groups of successive data segments to the width of the second widest reflective stripe represented by a data segment in said first group of data segments;

performing an eighth analysis on said first group of said groups of successive data segments wherein said eighth analysis compares the width of the second widest nonreflective stripe represented by a data segment in said first group of data segments to the width of the third widest nonreflective stripe represented by a data segment in said first group of data segments and terminating said method if said widths are not within a predetermined value of one another.

5. The method of claim 4 further comprising repeating said performing a seventh analysis for all of said groups of data segments.

6. The method of claim 4 further comprising repeating said performing an eighth analysis for all of said groups of data segments.
7. The method of claim 4 further comprising performing a ninth analysis on said data wherein said ninth analysis deciphers each of said groups of data segments.
8. The method of claim 4 further comprising performing a tenth analysis on said data comprising deciphering said first group of data segments to yield a start character and comparing said start character to a predetermined character.
9. The method of claim 8 further comprising reversing the order of said data segments based on the result of said analysis.
10. The method of claim 4 further comprising performing an eleventh analysis on said data comprising deciphering the last group of data segments to yield a stop character and comparing said stop character to a predetermined character.

Patentansprüche

1. Ein Verfahren zum Lesen von Strichcodes, das folgende Schritte aufweist:

Empfangen von Daten, die ein Bild des Strichcodes (132) darstellen, der gelesen werden soll; Durchführen einer ersten Analyse an den Daten, wobei die erste Analyse bestimmt, ob der Strichcode (132) durch Bereiche eines Reflexionsvermögens begrenzt ist, und Beenden des Verfahrens, falls der Strichcode nicht durch Bereiche eines Reflexionsvermögens begrenzt ist; Durchführen einer zweiten Analyse an den Daten, wobei die zweite Analyse die Anzahl von Streifen an dem Strichcode (132) zwischen den Bereichen eines Reflexionsvermögens zählt, und Beenden des Verfahrens, falls die Anzahl von Streifen nicht gleich einer vorbestimmten Anzahl ist; Durchführen einer dritten Analyse an den Daten, wobei die dritte Analyse die Breite des breitesten reflektierenden Streifens an dem Strichcode (132) mit der Breite des zweitbreitesten reflektierenden Streifens an dem Strichcode (132) vergleicht, und Beenden des Verfahrens, falls das Verhältnis der Breite des breitesten reflektierenden Streifens zu der Breite des zweitbreitesten reflektierenden Streifens nicht größer als ein vorbestimmter Wert ist; Durchführen einer vierten Analyse an den Daten, wobei die vierte Analyse die Breite des zweitbreitesten nichtreflektierenden Streifens

an dem Strichcode (132) mit der Breite des drittbreitesten nichtreflektierenden Streifens an dem Strichcode (132) vergleicht, und Beenden des Verfahrens, falls das Verhältnis der Breite des breitesten reflektierenden Streifens zu der Breite des drittbreitesten nichtreflektierenden Streifens nicht größer als ein vorbestimmter Wert ist; Durchführen einer fünften Analyse an den Daten, wobei die fünfte Analyse die Daten entschlüsselt.

2. Das Verfahren gemäß Anspruch 1, bei dem das Durchführen einer zweiten Analyse ein Bestimmen aufweist, ob an dem Strichcode (132) zwischen den Bereichen eines Reflexionsvermögens neun Streifen vorhanden sind.
3. Das Verfahren gemäß Anspruch 1, bei dem der Strichcode (132) an einem Medienstück (120) befestigt ist.
4. Das Verfahren gemäß Anspruch 1, bei dem die Daten eine Reihe von Datensegmenten aufweisen und wobei jedes Datensegment einen Streifen an dem Strichcode (132) darstellt; Durchführen einer sechsten Analyse an den Daten, wobei die sechste Analyse die Anzahl der Datensegmente zählt, und Beenden des Verfahrens, falls die Anzahl der Datensegmente nicht gleich einem vorausgewählten Wert ist; Gruppieren der Datensegmente zu Gruppen von aufeinander folgenden Datensegmenten, wobei jede Gruppe eine vorbestimmte Anzahl von Datensegmenten aufweist; Durchführen einer siebten Analyse an einer ersten Gruppe der Gruppen von aufeinander folgenden Datensegmenten, wobei die siebte Analyse die Breite des breitesten reflektierenden Streifens, der durch ein Datensegment in der ersten Gruppe der Gruppen von aufeinander folgenden Datensegmenten dargestellt ist, mit der Breite des zweitbreitesten reflektierenden Streifens, der durch ein Datensegment in der ersten Gruppe von Datensegmenten dargestellt ist, vergleicht; Durchführen einer achten Analyse an der ersten Gruppe der Gruppen von aufeinander folgenden Datensegmenten, wobei die achte Analyse die Breite des zweitbreitesten nichtreflektierenden Streifens, der durch ein Datensegment in der ersten Gruppe von Datensegmenten dargestellt ist, mit der Breite des drittbreitesten nichtreflektierenden Streifens, der durch ein Datensegment in der ersten Gruppe von Datensegmenten dargestellt ist, vergleicht, und Beenden des Verfahrens, falls die Breiten nicht innerhalb eines vorbestimmten Werts voneinander liegen.

5. Das Verfahren gemäß Anspruch 4, das ferner ein Wiederholen des Durchführens einer siebten Analyse für alle der Gruppen von Datensegmenten aufweist.
6. Das Verfahren gemäß Anspruch 4, das ferner ein Wiederholen des Durchführens einer achten Analyse für alle der Gruppen von Datensegmenten aufweist.
7. Das Verfahren gemäß Anspruch 4, das ferner ein Durchführen einer neunten Analyse an den Daten aufweist, wobei die neunte Analyse jede der Gruppen von Datensegmenten entschlüsselt.
8. Das Verfahren gemäß Anspruch 4, das ferner ein Durchführen einer zehnten Analyse an den Daten aufweist, die ein Entschlüsseln der ersten Gruppe von Datensegmenten, um ein Anfangsschriftzeichen zu ergeben, und ein Vergleichen des Anfangsschriftzeichens mit einem vorbestimmten Schriftzeichen aufweist.
9. Das Verfahren gemäß Anspruch 8, das ferner ein Umkehren der Reihenfolge der Datensegmente basierend auf dem Ergebnis der Analyse aufweist.
10. Das Verfahren gemäß Anspruch 4, das ferner ein Durchführen einer elften Analyse an den Daten aufweist, die ein Entschlüsseln der letzten Gruppe von Datensegmenten, um ein Stoppschriftzeichen zu ergeben, und ein Vergleichen des Stoppschriftzeichens mit einem vorbestimmten Schriftzeichen aufweist.

Revendications

1. Procédé de lecture de codes à barres comprenant les étapes consistant à:

recevoir des données représentant une image dudit code (132) à barres qui doit être lu;

exécuter une première analyse sur lesdites données, ladite première analyse déterminant si ledit code (132) à barres est limité par des zones de réflectivité, et terminer ledit procédé si ledit code à barres n'est pas limité par des zones de réflectivité;

exécuter une deuxième analyse sur lesdites données, ladite deuxième analyse comptant le nombre de bandes sur ledit code (132) à barres entre lesdites zones de réflectivité, et terminer ledit procédé si ledit nombre de bandes n'est pas égal à un nombre prédéterminé;

exécuter une troisième analyse sur lesdites données, ladite troisième analyse comparant la largeur de la bande réfléchissante la plus large sur

ledit code (132) à barres et la largeur de la bande réfléchissante qui est deuxième dans l'ordre des largeurs décroissantes sur ledit code (132) à barres, et terminer ledit procédé si le rapport entre la largeur de la bande réfléchissante la plus large et la largeur de la bande réfléchissante qui est deuxième dans l'ordre des largeurs décroissantes n'est pas supérieur à une valeur prédéterminée;

exécuter une quatrième analyse sur lesdites données, ladite quatrième analyse comparant la largeur de la bande non réfléchissante qui est deuxième dans l'ordre des largeurs décroissantes sur le code (132) à barres et la largeur de la bande non réfléchissante qui est troisième dans ledit ordre sur ledit code (132) à barres, et terminer ledit procédé si le rapport entre les largeurs de la bande non réfléchissante qui est deuxième dans l'ordre des largeurs décroissantes et de la bande non réfléchissante qui est troisième dans ledit ordre n'est pas supérieur à une valeur prédéterminée; et

exécuter une cinquième analyse sur lesdites données, ladite cinquième analyse déchiffrant lesdites données.

2. Procédé selon la revendication 1 dans lequel ladite exécution d'une deuxième analyse comprend une étape consistant à déterminer si neuf bandes sont présentes sur ledit code (132) à barres entre lesdites zones de réflectivité.

3. Procédé selon la revendication 1, dans lequel ledit code (132) à barres est fixé sur un élément (120) de support.

4. Procédé selon la revendication 1 dans lequel lesdites données comprennent une série de segments de données, et dans lequel chaque segment de données représente une bande sur ledit code (132) à barres;

et qui comprend en outre les étapes consistant à:

exécuter une sixième analyse sur lesdites données, ladite sixième analyse comptant le nombre desdits segments de données, et terminer ledit procédé si le nombre desdits segments de données n'est pas égal à une valeur présélectionnée;

grouper lesdits segments de données en groupes de segments successifs de données où chaque groupe comprend un nombre prédéterminé de segments de données;

exécuter une septième analyse sur ledit premier groupe desdits groupes de segments successifs de données, ladite septième analyse comparant la largeur de la bande réfléchissante la plus large représentée par un segment de données in-

- clus dans ledit premier groupe desdits groupes de segments successifs de données et la largeur de la bande réfléchissante qui est deuxième dans l'ordre des largeurs décroissantes des bandes réfléchissantes représentée par un segment de données inclus dans ledit premier groupe de segments de données; 5
- exécuter une huitième analyse sur ledit premier groupe desdits groupes de segments successifs de données, ladite huitième analyse comparant la largeur de la bande non réfléchissante qui est deuxième dans l'ordre des largeurs décroissantes représentée par un segment de données inclus dans ledit premier groupe de segments de données et la largeur de la bande non réfléchissante qui est troisième dans ledit ordre représentée par un segment de données inclus dans ledit premier groupe de segments de données, et terminer ledit procédé si lesdites largeurs ne sont pas à l'intérieur d'une valeur prédéterminée l'une de l'autre. 20
5. Procédé selon la revendication 4 qui comprend en outre une étape consistant à répéter ladite exécution d'une septième analyse pour tous lesdits groupes de segments de données. 25
6. Procédé selon la revendication 4 qui comprend en outre une étape consistant à répéter ladite exécution d'une huitième analyse pour tous lesdits groupes de segments de données. 30
7. Procédé selon la revendication 4 qui comprend en outre une exécution d'une neuvième analyse sur lesdites données, ladite neuvième analyse déchiffrant chacun desdits groupes de segments de données. 35
8. Procédé selon la revendication 4 qui comprend en outre une exécution d'une dixième analyse sur lesdites données, qui comprend un déchiffrement dudit premier groupe de segments de données pour obtenir un caractère de début, et une comparaison dudit caractère à un caractère prédéterminé. 40
9. Procédé selon la revendication 4 qui comprend en outre une étape d'inversion de l'ordre desdits segments de données en fonction du résultat de ladite analyse. 45
10. Procédé selon la revendication 4 qui comprend en outre une exécution d'une onzième analyse sur lesdites données, qui comprend un déchiffrement du dernier groupe de segments de données pour obtenir un caractère d'arrêt, et une comparaison dudit caractère à un caractère prédéterminé. 50 55

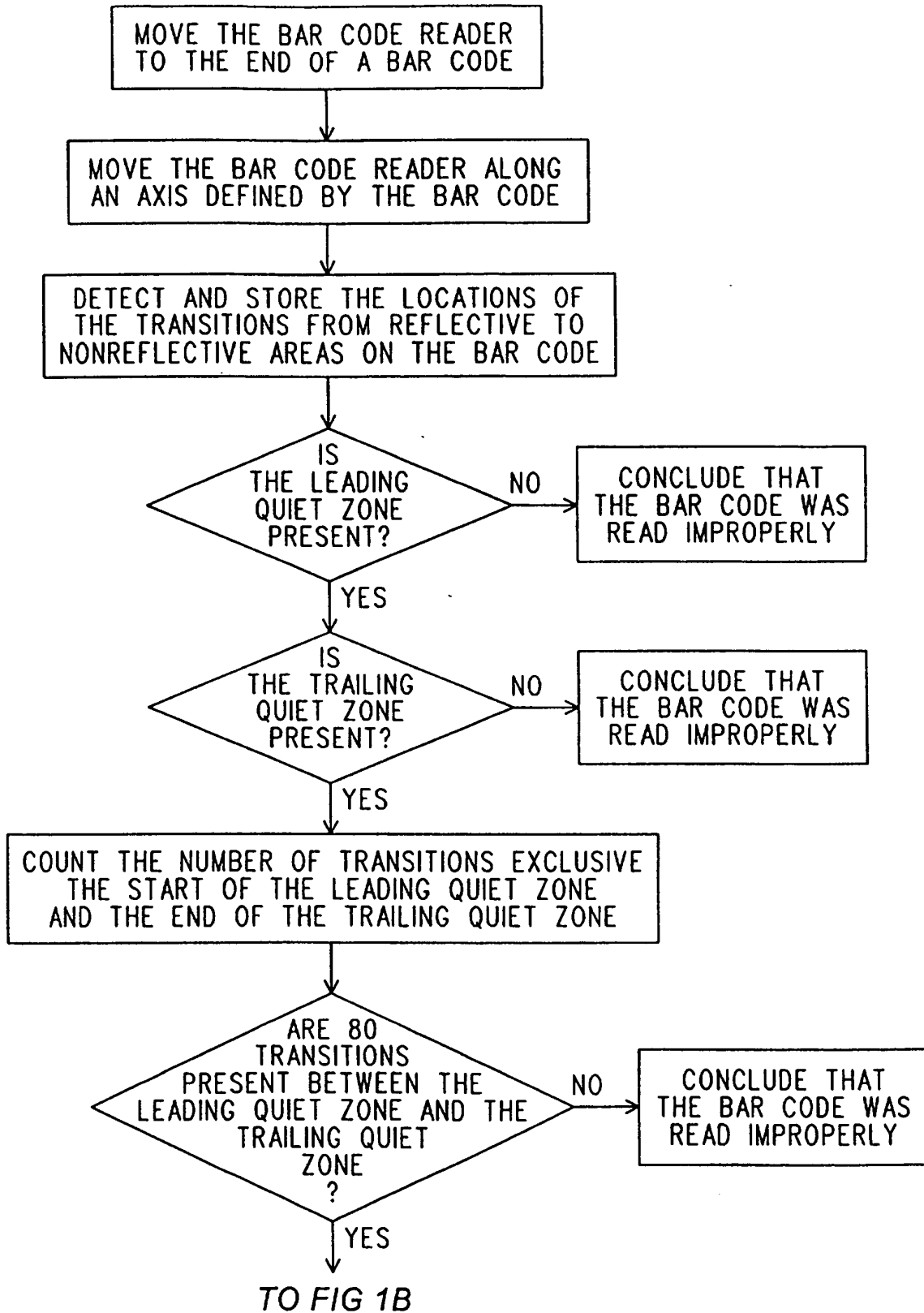


FIG. 1A

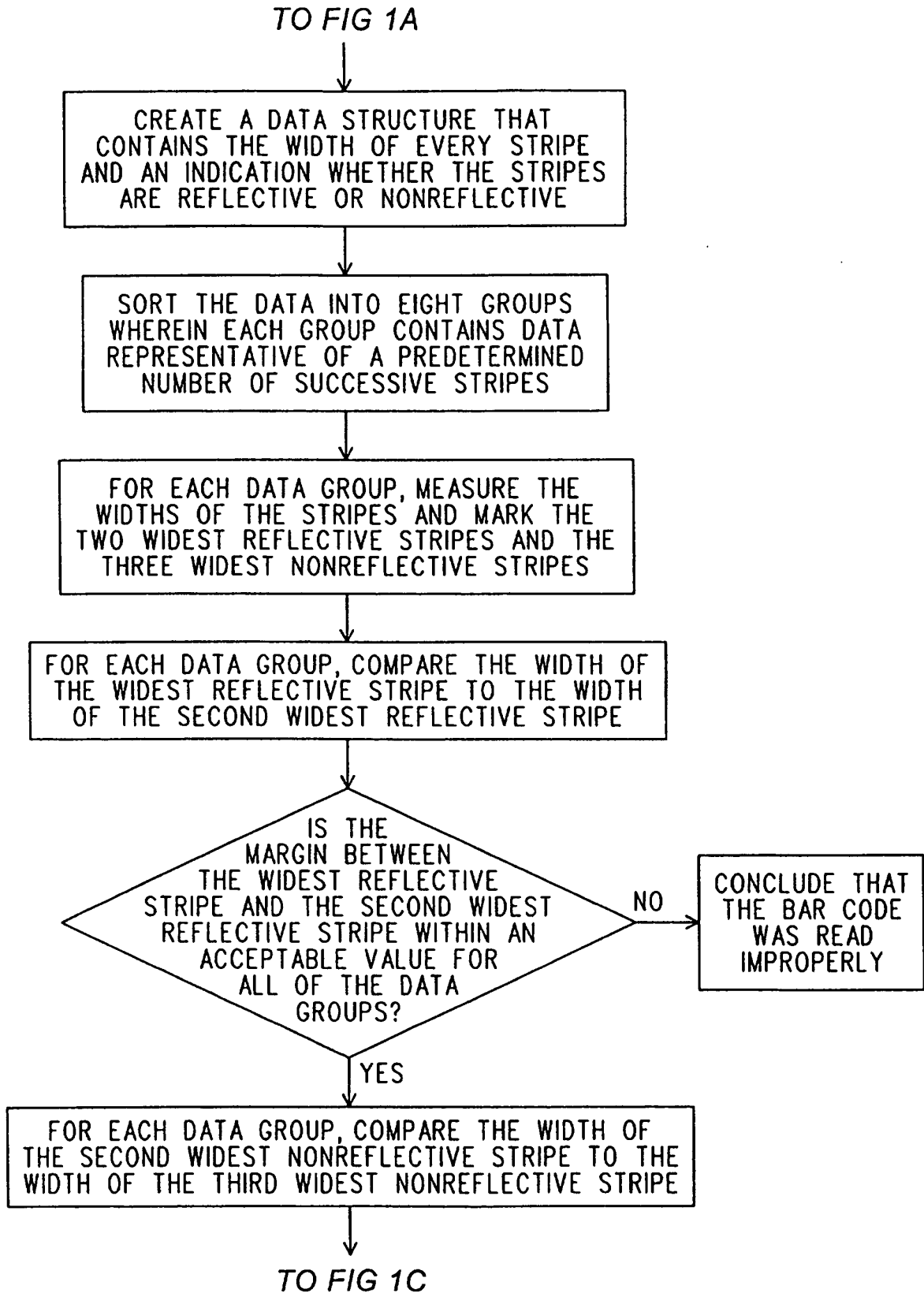


FIG. 1B

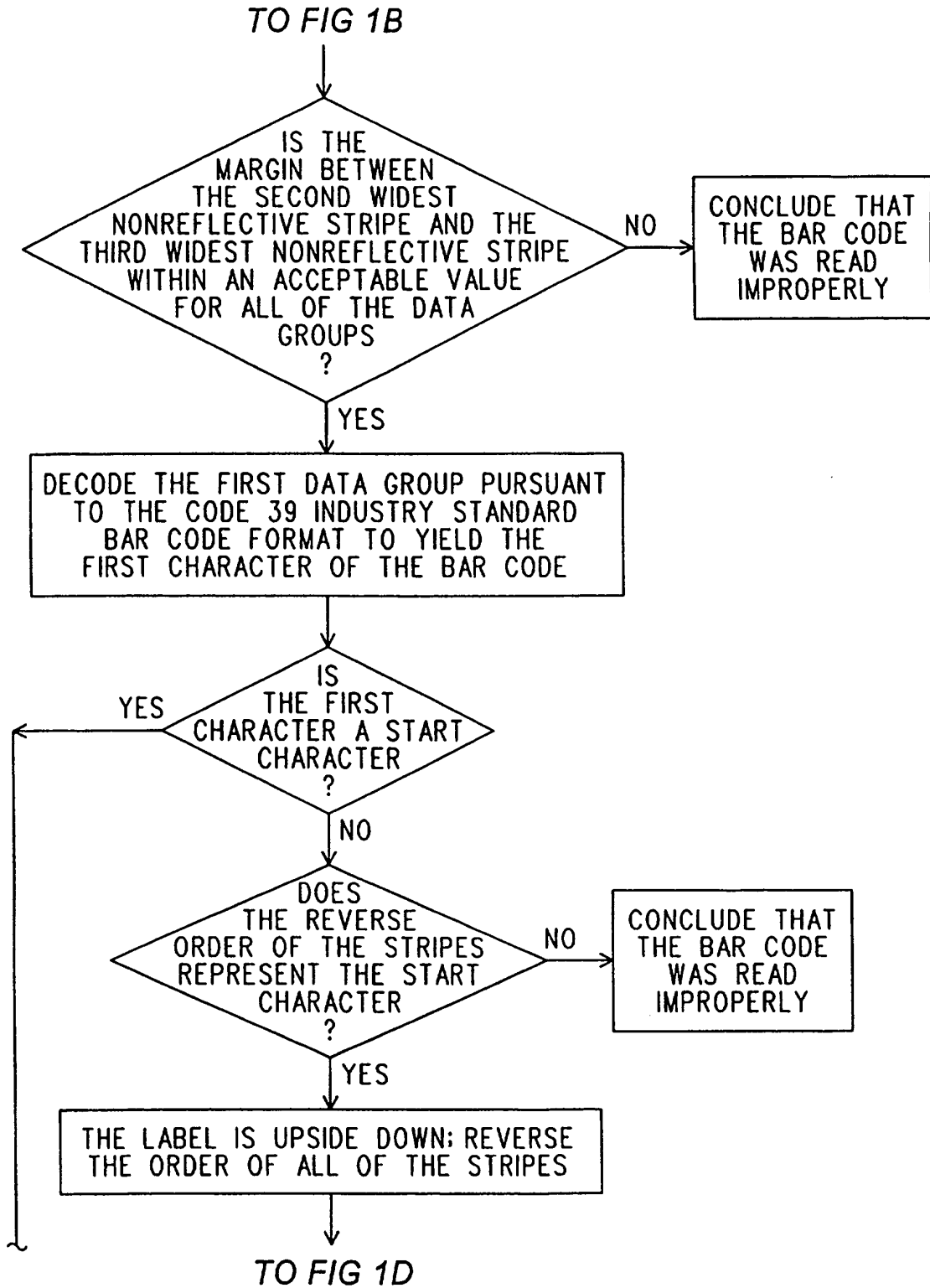


FIG. 1C

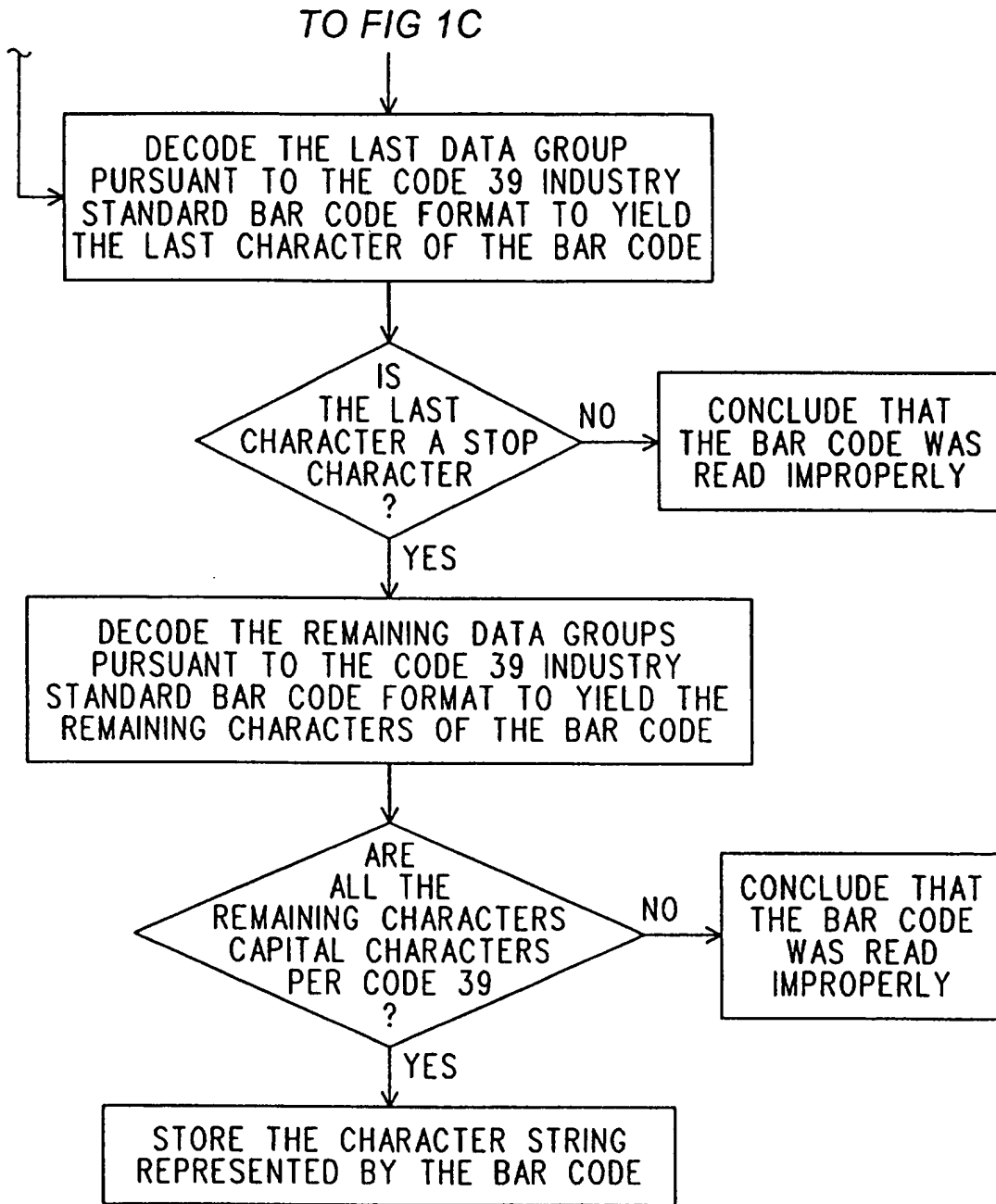


FIG. 1D

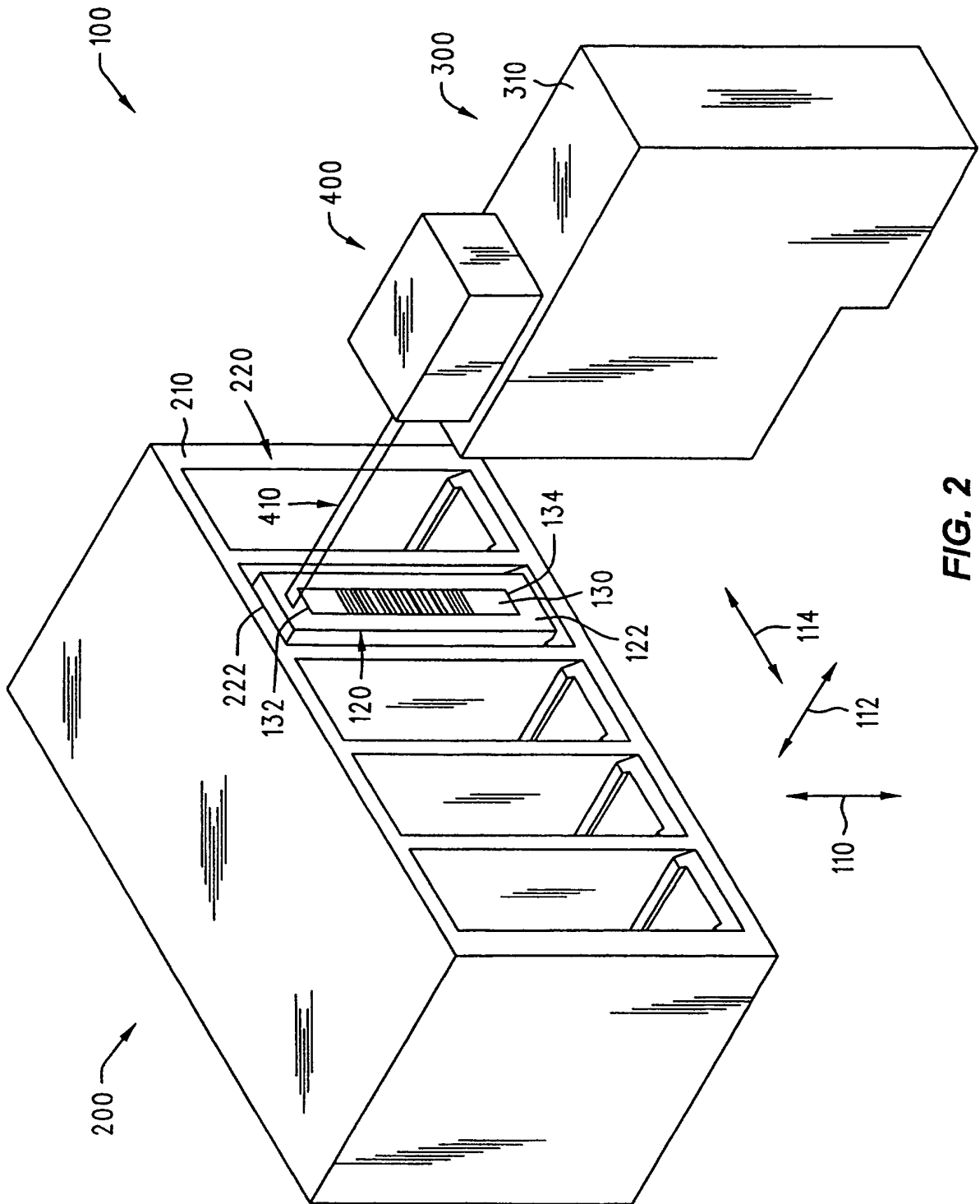


FIG. 2